

Eucalyptus series *Brevifoliae* (Myrtaceae), a new series of northern Australian eucalypts

M.I.H. Brooker and A.V. Slee

CSIRO Division of Plant Industry, GPO Box 1600, Canberra, Australian Capital Territory 2601

Abstract

Brooker, M.I.H. and Slee, A.V. *Eucalyptus* series *Brevifoliae* (Myrtaceae), a new series of northern Australian eucalypts. Nuytsia 9 (3): 307-314 (1994). A new infrageneric taxon, *Eucalyptus* series *Brevifoliae* is described. The group consists of six species of northern Australian white gums, viz. *E. confluens*, *E. rupestris* and *E. ordiana*, endemic to the Kimberley in Western Australia, *E. brevifolia*, from the Kimberley and adjacent parts of the Northern Territory, *E. umbrawarrensis* endemic to the Top End of the Northern Territory, and *E. leucophloia* which occurs from the Pilbara across the Northern Territory to western Queensland. The series is diagnosed by seed and leaf characters.

Introduction

The first species of the new series to be published is *Eucalyptus brevifolia* F. Muell. in 1858. The subsequent history of this species and its implied synonymy with *E. microtheca* (Bentham 1867) were meticulously researched by Blake (1953), who rejected this synonymy and classified *E. brevifolia* with a subgroup of red gums, *E. ser. Subexsertae* (Benth.) Blakely.

The next species of the series to be published is *E. pallidifolia* F. Muell. which Bentham (1867) placed in the heterogeneous *E. subser. Exsertae* Benth., the other subgroup of red gums typified by *E. exserta* F. Muell. Blake, much later (1953), concluded that *E. pallidifolia* was a taxonomic synonym of *E. brevifolia*. The third species is *E. confluens* W.V. Fitzg. ex Maiden whose affinities Maiden considered to be "unsolved", despite Fitzgerald's suggestion quoted by Maiden (1919), of a relationship to *E. rudis* Endl. Blakely (1934) placed *E. confluens* in *E. ser. Exsertae* (Benth.) Blakely. The fourth of these early published species is *E. umbrawarrensis* Maiden, which the author associated with *E. pallidifolia*.

Blakely (1934) supported Bentham's synonymy of *Eucalyptus brevifolia* with *E. microtheca*. He placed *E. pallidifolia* in the *Subexsertae*, maintained *E. confluens* in the *Exsertae* and placed *E. umbrawarrensis* in the *Subulatae*, a series otherwise comprising species with bisected cotyledons.

Blake (1953) maintained the erroneous placement for *E. umbrawarrensensis* although *E. umbrawarrensensis* has reniform cotyledons in common with the *Exsertae* and *Subexsertae*.

Pryor & Johnson (1971) associated both *E. brevifolia* (syn. *E. pallidifolia*) and *E. confluens* with *E. alba* in the extracodical ser. *Albae* in their classification (ser. *Subexsertae*). However, they classified *E. umbrawarrensensis* in an ambiguously-placed monotypic series, well isolated in their system from all three series, *Exsertae*, *Subexsertae* and *Subulatae*. Subsequent unpublished research by Johnson has resulted in the segregation in a subseries of all three species within ser. *Albae*.

Three more species with affinity to the above-mentioned have been published, viz. *E. leucophloia* Brooker (1976), *E. rupestris* Brooker & Done (1986), and *E. ordiana* Dunlop & Done (1992). The first five of these species reviewed in this study were included in the *Subexsertae* by Chippendale (1988). The more recently published *E. ordiana* was placed in the *Subexsertae* by Dunlop & Done, the authors acknowledging its particular affinity within the series, based on seed characters, with *E. brevifolia*, *E. confluens*, *E. umbrawarrensensis* and *E. leucophloia*.

Seed characters

Dunlop & Done associated the seed form of *Eucalyptus ordiana* with that of a "subgroup of species" given in Boland *et al.* (1980), i.e. those named above, without contrasting it with the seed of the remainder of the *Subexsertae*.

Both the *Subexsertae* (less the species treated above), typified by *E. alba*, and the *Exsertae*, typified by *E. exserta*, have similar and characteristic seeds. The morphology of this form of seed was treated at length by Maiden (1925) and Boland *et al.* (1980). The seeds are dark brown to black and have dorsal and ventral sides separated by a margin that is either partly or entirely toothed. The ventral side (Figure 1a) is elongated, pyramidal or somewhat flattened but always with angles and faces. The hilum is on a small terminal polygonal face or at the summit of the pyramid or more or less central to the angular flattened face. The dorsal surface (Figure 1b) is flat or slightly convex, without angles. Both surfaces of the seed show slight relief due to the collapsed or sunken outer cell walls of the testa. The walls of the cells towards the margin of the seed are characteristically sunken deeper and the outlines of the cell are always very irregular in shape (Figure 1c).

This seed form is diagnostic in the genus *Eucalyptus* for the *Exsertae* and *Subexsertae* and for series *Transversae*.

The seeds of *E. brevifolia*, *E. confluens*, *E. umbrawarrensensis*, *E. leucophloia*, *E. rupestris* and *E. ordiana* do not fit this pattern. They are light brown, flattened and ventrally concave, without toothed edges, and with a more or less sunken ventral hilum (Figure 2a). The ventral and dorsal surfaces of the seed contrast, as well, with those of series *Exsertae* and *Subexsertae*. The integument is distinctly and regularly reticulate having cells, with uniformly and shallowly sunken outer cell walls, often arranged in lines over much of the surface (Figures 2a-c). There is characteristically no distinct edge separating the dorsal and ventral sides of the seed.

The general morphology of the seeds of the *E. brevifolia* group resembles superficially that of the seeds of several other series. Considering various series in the classification of Chippendale (1988) and dismissing any relationship with the groups having bisected cotyledons and those with adnate anthers, we make the following comparisons.

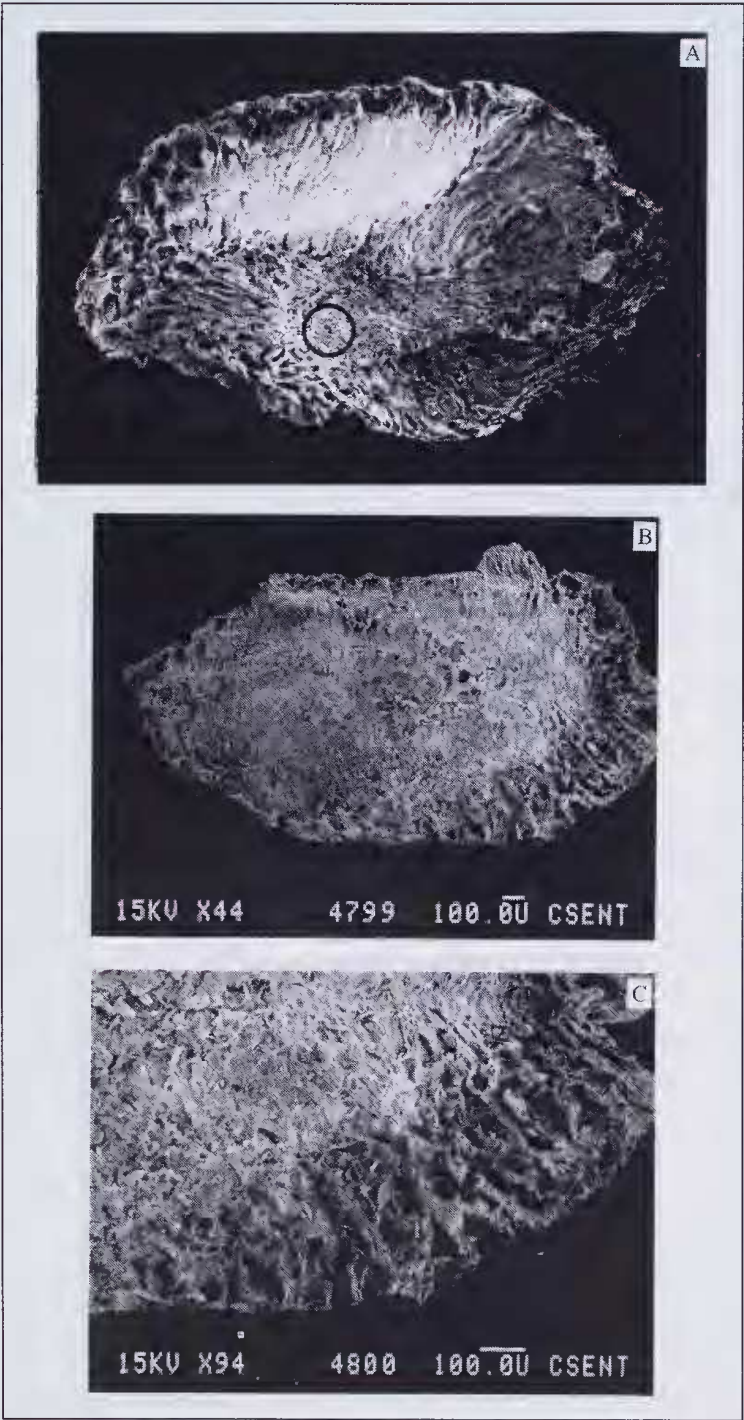


Figure 1. Seed of *Eucalyptus alba*, Timor, J. Turnbull 202. a - ventral (hilar) view, circle indicates hilum (x40), b - dorsal view (x30), c - detail of toothed margin (x62).

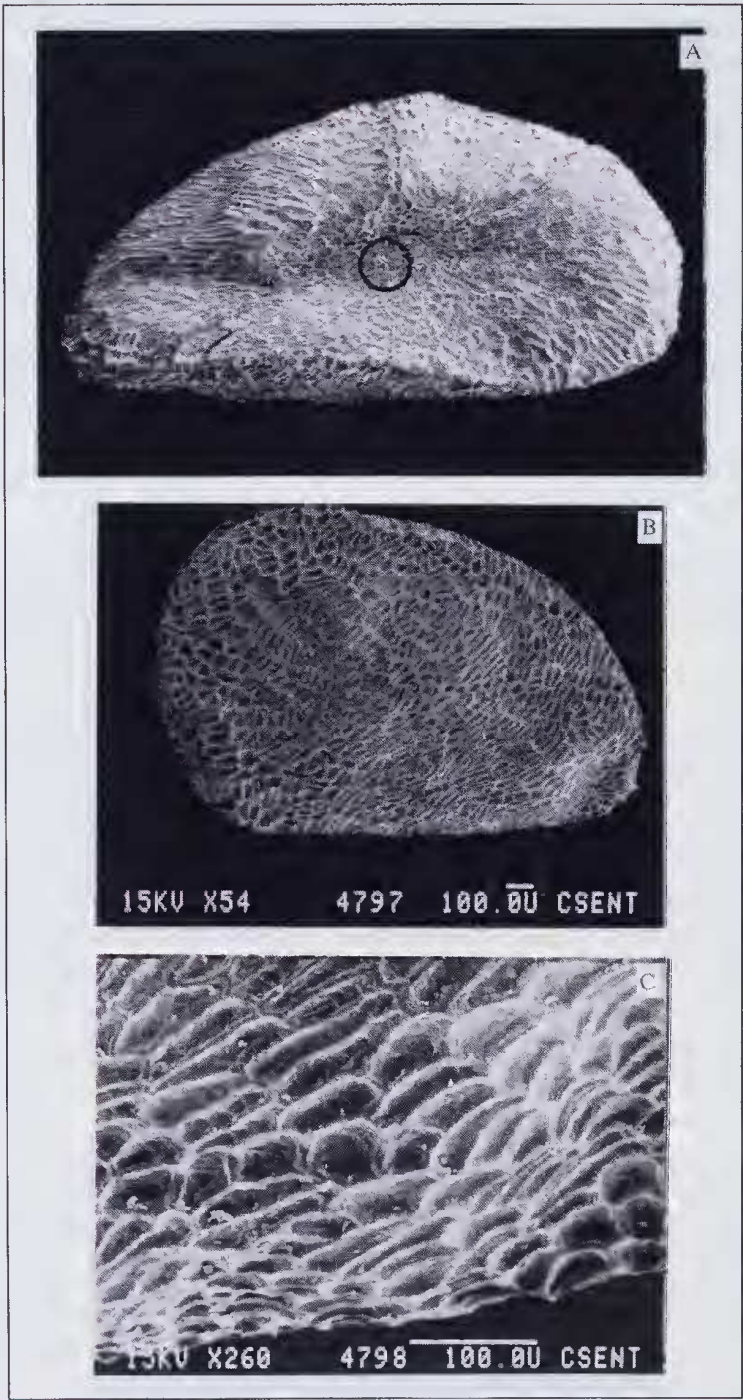


Figure 2. Seed of *Eucalyptus brevifolia*, King River crossing towards Karunjie, Western Australia, M.I.H. Brooker 4228. a - ventral (hilar) view, circle indicates hilum (x38), b - dorsal view (x35), c - detail of surface (x175).

The seeds of the monotypic series *Pumilae* and *Michaelianae* are toothed around the edges. The seed of *E. pumila* has, in addition, unique dorsal patterning while that of *E. michaeliana*, in most respects, resembles red gum seed (Boland *et al.* 1980). The seeds of series *Foveolatae*, *Microcarpae* and *Viminales* are similar in general shape to the seeds of the *E. brevifolia* group. They differ, however, in being grey-black, with a flatter, lacunose dorsal surface (Boland *et al.* 1980), that of the *E. brevifolia* group being light brown, plump, convex and lacking lacunae.

Leaf venation and oil gland patterns

Eucalypts have evolved a variety of leaf venation patterns which differ notably in the amount of reticulation, from none observable by casual inspection to extremely dense, and in the angle of departure of the side veins from the midrib, from parallel side veins (snow gums) to veins at an angle of almost 90 degrees (bloodwoods).

Endemic northern Australian species, including those of the *Brevifoliae*, invariably have extremely dense reticulation, e.g. *E. umbrawarrensii* (Figure 3). This distinguishes them from any species of south-eastern Australia belonging to other taxonomic groups, e.g. *E. viminalis* (Figure 4), which may have superficially similar seeds as referred to above.

Contrary to common belief, many eucalypts are almost completely lacking in visible oil glands and do not have the characteristic eucalyptus smell when leaves are crushed. This is so with many endemic northern species. Exceptions include *E. staigeriana* and *E. camaldulensis* (Figure 5) which are, however, northern representatives of predominantly southern series, in terms of numbers of species. In the *Subexsertae*, e.g. *E. bigalerita* (Figure 6) some oil glands are invariably present although they are often obscure and many fewer than in the *Exsertae*.

The leaves of all the species of the *E. brevifolia* group are almost entirely lacking in visible oil glands (Figure 3). This distinguishes them from most southern species in the genus that have similar seeds (Figure 4). Also, oil glands which may be present in the leaves of the *E. brevifolia* group always appear at the intersections of veinlets only. In southern species, the oil glands are seen mainly within the areoles although intersectional ones are usually present.

We conclude that the *E. brevifolia* group of species are not red gums (*Exsertae* and *Subexsertae*), nor do they have natural affinity with any groups in southern Australia, but that they make up a discrete taxon. We erect therefore a new taxonomic series.

Taxonomy

***Eucalyptus* ser. *Brevifoliae* Brooker & Slee, ser. nov.**

Arbores parvae vel "mallees" cortice laevi. Reticulum foliorum densissimum et glandulae si manifestae intersectionales. Semina plus minusve complanata sed dorsaliter convexa, elliptica, pallido-brunnea, integumento scalariformi, hilo ventrali, marginibus sinuato-dentatis omnino deficientibus.

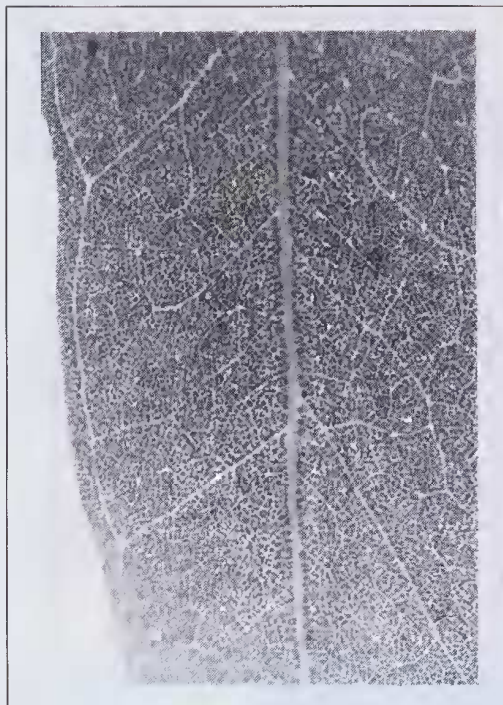


Figure 3. Leaf venation in *E. umbrawarrensis* (Brooker s.n., road to Umbrawarra Gorge, Northern Territory, June 1988).

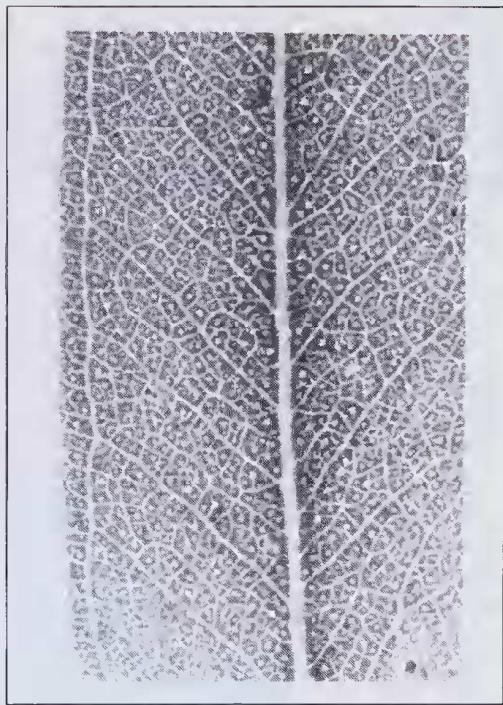


Figure 4. Leaf venation in *E. viminalis* (Brooker 11229).

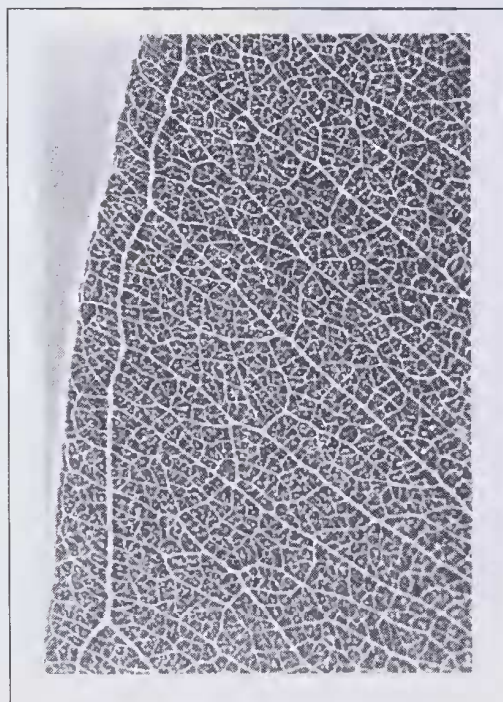


Figure 5. Leaf venation in *E. camaldulensis* (Brooker s.n., Gibb River, Western Australia, April 1991).

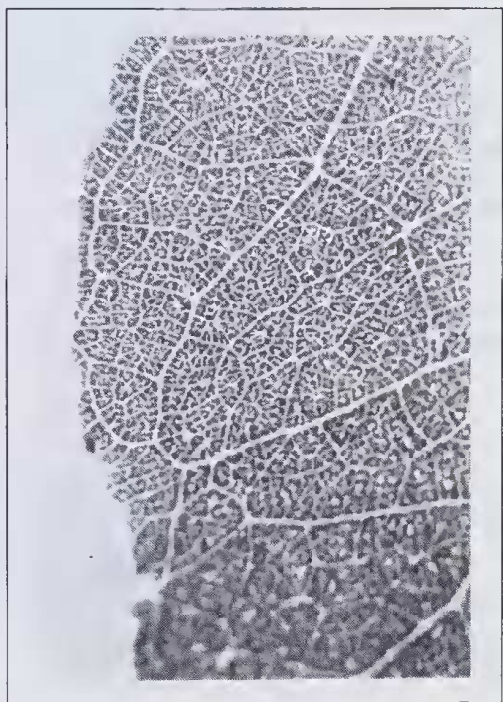


Figure 6. Leaf venation in *E. bigalerita* (Brooker s.n., Hann River, Western Australia, April 1991).

Typus: *E. brevifolia* F. Muell.

Small trees or more rarely mallees, usually on rocky sites. Bark always smooth. Reticulation of leaves very dense and oil glands, if present, appearing at the intersections of the veinlets. Seeds more or less flat but convex on the dorsal side, elliptic, light brown, distinctly scalariform on the dorsal surface, never toothed at the edges.

Notes. The series comprises six species, viz. *E. brevifolia*, *E. confluens*, *E. leucophloia*, *E. rupestris*, *E. umbrawarrensensis* and *E. ordiana*. The series is distributed from the western scarps of Arnhem Land to the Kimberley and south to the Pilbara and east across northern central Australia to western Queensland. The trees are sometimes dominant in arid areas and rocky sites, and are conspicuous with their smooth white bark.

Etymology. The name for the series is taken from the epithet of its first published species.

Key to the species and subspecies of *E. ser. Brevifoliae*

- 1. Adult leaves glossy green
 - 2. Fruit with annular disc *E. confluens*
 - 2. Fruit with inconspicuous narrow descending disc *E. umbrawarrensensis*
- 1. Adult leaves dull blue-green to glaucous
 - 3. Whole plant glaucous; leaves opposite, ovate to orbicular *E. ordiana*
 - 3. Otherwise
 - 4. Fruit with prominent annular disc *E. brevifolia*
 - 4. Fruit with inconspicuous narrow descending disc
 - 5. Petioles of adult leaves >1 cm long, slender; fruit cupular *E. rupestris*
 - 5. Petioles of adult leaves < or = 1 cm long; fruit hemispheric
 - 6. Valves of fruit enclosed or to rim level *E. leucophloia* subsp. *leucophloia*
 - 6. Valves of fruit strongly exserted *E. leucophloia* subsp. *E* *

* To be published by others.

Acknowledgements

We are grateful to Helen Geier for some of the scanning electron micrographs taken in the CSIRO Microscopy Unit at Black Mountain, Canberra, and to Lawrie Johnson for helpful suggestions made concerning an earlier draft.

References

- Bentham, G. (1867). "Flora Australiensis" Vol. 3. (L. Reeve & Co.: London.)
- Blake, S.T. (1953). Botanical contributions of the Northern Australian Regional Survey. I. Studies on northern Australian species of *Eucalyptus*. Austral. J. Bot. 1: 185-352.
- Blakely, W.F. (1934). "A Key to the Eucalypts". (The Worker Trustees: Sydney.)
- Boland, D.J., Brooker, M.I.H. & Turnbull, J.W. (1980). "*Eucalyptus* Seed". (CSIRO: Melbourne.)
- Brooker, M.I.H. (1976). Six new taxa of *Eucalyptus* from Western Australia. Nuytsia 2: 103-117.
- Brooker, M.I.H. & Done, C.C. (1986). *Eucalyptus ceracea*, *E. rupestris* and *E. chlorophylla* (Myrtaceae), three new species from the Kimberley Division of Western Australia. Nuytsia 5: 381-390.
- Chippendale, G.M. (1988). "Flora of Australia" Vol. 19. (Australian Government Publishing Service: Canberra.)
- Dunlop, C.R. & Done, C.C. (1992). *Eucalyptus ordiana* (Myrtaceae), a new species from the Kimberley, Western Australia. Nuytsia 8: 195-199.
- Maiden, J.H. (1919). "A Critical Revision of the Genus *Eucalyptus*". Part 36. (Government Printer: Sydney.)
- Maiden, J.H. (1925). "A Critical Revision of the Genus *Eucalyptus*". Part 64. (Government Printer: Sydney.)
- Pryor, L.D. & Johnson, L.A.S. (1971). "A Key to the Eucalypts". (Australian National University Press: Canberra.)